REMARKS:

1) According to the PCT procedures, the original specification of this application was a direct literal translation of the foreign language text of the corresponding PCT International Application. The specification has now been amended editorially and formally to better comply with typical US application format (e.g. with section headings, and without reference to particular claim numbers in the description), and to correct the idiomatic English terminology, grammar, sentence construction, etc. in some passages of the literally translated text. The abstract has also been amended editorially and formally to better comply with US abstract requirements. These amendments are all supported by the substance and the context of the original disclosure, and do not introduce any new matter. Entry of the specification amendments is respectfully requested.

2) Claim 1 has been amended by making a few minor editorial revisions and by adding a further substantive feature, namely that the signal information indicating the beginning of combustion in a particular cylinder is extracted from the cylinder frequency signal <u>with regard to amplitude and phase values associated with a predefined angular frequency</u>. This feature is supported in the original disclosure and does not introduce any new matter (for example see page 7 lines 11 to 25 and page 9 lines 1 to 26). A final step of expressly detecting the beginning of combustion from the signal information has also been added, as supported by ones 1, 2, 19 and 20 of prior,

claim 1. Entry and consideration of the claim amendments are respectfully requested.

3) Referring to section 3 on page 2 of the Office Action, the rejection of claims 1 to 3 and 11 to 17 as obvious over US Patent 5,239,473 (Ribbens et al.) is respectfully traversed.

Present independent claim 1 is directed to a method for <u>detecting the beginning of combustion</u> in an internal combustion engine from a rotation speed signal determined for a shaft of the engine. To carry out this method, first a segment signal is extracted from the rotation speed signal, whereby this segment signal represents the rotational angular range in which each cylinder of the engine fires one time, which corresponds to one or more complete rotations of the shaft of the engine. Then a cylinder signal providing the signal information of one particular cylinder is generated from the segment signal. Next, this cylinder signal is transformed from the time domain into the frequency domain to provide a cylinder frequency signal in an angular frequency range for this particular cylinder. The method next involves extracting from this cylinder frequency signal, a signal information indicating the beginning of combustion in the particular cylinder with regard to amplitude and phase values associated with the predefined angular frequency. Finally, the method involves detecting the beginning of combustion from the signal information.

It is a key feature of the present invention that <u>a signal information is extracted from the cylinder frequency signal, with</u>

regard to amplitude and phase values associated with a predefined angular frequency, and this signal information is used as an **indication of the beginning of combustion** in the pertinent cylinder, so that the beginning of combustion is detected from this signal information. In this regard see the present specification at page 7 lines 11 to 25 and page 9 lines 1 to 26.

In contrast to the present invention, the Ribbens et al. patent discloses a method of detecting misfire in an internal combustion engine based on angular velocity fluctuations, rather than detecting the beginning of combustion in a cylinder of the engine. In order to detect misfire, the method of Ribbens et al. involves evaluating the torque produced by the crankshaft in order to determine whether non-uniformities in the progression of the torque are due to normal fluctuations or are due to misfires. To achieve this, either a torque signal or an angular velocity signal **relating to the firing of all cylinders** is sampled from the crankshaft, windowed and then transformed from the time domain into the frequency domain (see col. 9 lines 11 to 20, col. 9 line 59 to col. 10 line 4). This produces an M-dimensional torque non-uniformity vector, which is analyzed in order to distinguish between normal fluctuations of torque due to normal combustion variations on the one hand, and a misfire on the other hand (see col. 12 lines 38 to 67). Detection of the misfire is based on comparing statistical data for normal cyclic variations in combustion with statistical data for misfire events (see col. 13 lines 3 to 48). After the occurrence of a misfire has been determined from the signal relating to all **cylinders,**

thereafter the Ribbens et al. method further determines **which cylinder** has misfired (col. 13 lines 44 to 68).

From the disclosure of Ribbens et al. as discussed above, it is apparent that Ribbens et al. do not disclose, and would not have suggested anything about or toward a step of detecting the beginning of combustion in a cylinder of an internal combustion engine. Ribbens et al. are not concerned with determining or detecting the beginning point of combustion in a cylinder, but rather Ribbens et al. are aiming to determine whether the variations of the torque output of an engine crankshaft are due to normal variations of combustion in the several cylinders, or are due to misfire events, by comparing the measured torque data with statistical data. That does not involve determining or detecting the beginning point of combustion.

More importantly, the method steps of Ribbens et al. for detecting a misfire are quite different from the method steps of the present inventive method for detecting the beginning of combustion. For example, in the present method, a segment signal in which each cylinder ignites one time is extracted from the rotation speed signal, and then a cylinder signal representing the operation of a single cylinder is derived from the segment signal. Thereafter, this individual cylinder signal is transformed from the time domain into the frequency domain to produce an individual cylinder frequency signal. In contrast, according to Ribbens et al., the overall crankshaft velocity or torque signal is transformed from the time domain into the

frequency domain (col. 9 line 59 to col. 10 line 10), and then misfiring is detected in the overall operation of the engine, and only thereafter the method tries to determine which faulty cylinder has suffered a misfire event (col. 13 lines 44 to 68).

Still further, Ribbens et al. do not disclose and would not have suggested to extract from an **individual cylinder frequency signal, a signal information indicating the beginning of combustion with regard to amplitude and phase values** associated with a predefined angular frequency. According to the present invention, this signal information is then used for detecting the beginning of combustion based on this signal information with regard to the amplitude and phase values. On the other hand, Ribbens et al. have nothing to due with such a detection, or even providing such signal information.

Regarding Fig. 6 of the reference, the Examiner has asserted "*from each of the low points such as, θ'_1 one **MAY** derive the beginning of combustion for each of the cylinders*" (emphasis added). That assertion does not form an appropriate basis for an obviousness rejection, and does not seem to be supported in any way by the reference. Namely, obviousness is not established by an assertion (with hindsight) of what "one **MAY**" do but rather what a person of ordinary skill would have been **TAUGHT** or **SUGGESTED** to do based on the teachings, suggestions, motivations, predictable results, or common sense supported by the prior art. The mere **POSSIBILITY** of doing something does not make it obvious; i.e. patentability is not limited to those things that would not have been **POSSIBLE**! Even if "*one **MAY** derive the beginning*

of combustion" from a torque signal shown in Fig. 6 of Ribbens et al., there would have been no suggestion or motivation to do so, or predictable result of doing so, provided by Ribbens et al. in this regard.

Also Ribbens et al. did not provide any enabling disclosure of how to carry that out, so that a person of ordinary skill would not have had the requisite reasonable expectation of success in doing what the Examiner now proposes that such a person could have done. The Examiner seems to be improperly using hindsight knowledge of the present invention to reconstruct the invention from insufficient and deficient teachings of Ribbens et al. Particularly, the present invention teaches that the beginning of combustion can be detected from a signal information indicating the beginning of combustion in a particular cylinder with regard to amplitude and phase values associated with a predefined angular frequency, after such signal information is produced by several method steps in sequence as now claimed. Ribbens et al. do not teach anything in this regard. In fact, even if the Examiner's present hindsight assertion is taken at face value, <u>such derivation of the beginning of combustion **from a torque signal for all cylinders**</u> such as shown in Fig. 6 of Ribbens et al. would not correspond to or suggest the present inventive method steps as discussed above. The present invention does not involve looking at a plot of torque for **all** cylinders over time and deriving the beginning of combustion from a low point of the torque. Instead, the present invention involves a sequence of method steps as

discussed above, which are not disclosed or suggested by the reference.

The dependent claims recite additional features that further distinguish the invention over the prior art, which the Examiner has not addressed in detail. For example, claims 2 and 3 are directed to further method steps by which the cylinder signal in the time domain may be determined from the segment signal that gives information for one cycle of one ignition of each cylinder. The Ribbens et al. reference is silent in this regard. According to claim 11, a single cylinder frequency signal is generated by a DHT or DFT transformation of the single cylinder signal in the time domain. The reference does not use such frequency transformation of a single individual cylinder signal. Claims 15 and 16 relate to further processing of the segment signal, which is also not disclosed by the reference. According to claim 17, the determined signal information indicating the beginning of combustion is used for regulating the beginning of combustion in the engine, which is also not the subject matter of Ribbens et al. The Examiner is respectfully requested to indicate where in the prior art it is asserted that the features of the present dependent claims are disclosed or suggested.

For the above reasons, the Examiner is respectfully requested to withdraw the rejection of claims 1 to 3 and 11 to 17 as obvious over Ribbens et al.

4) Favorable reconsideration and allowance of the application, including all present claims 1 to 3 and 11 to 17, are respectfully requested.

Respectfully submitted,

By [signature]

Walter F. Fasse
Patent Attorney
Reg. No.: 36132
Tel. 207-862-4671
Fax. 207-862-4681
P. O. Box 726
Hampden, ME 04444-0726

WFF:he/4964
Enclosures:
Transmittal Cover Sheet

CERTIFICATE OF FAX TRANSMISSION:

I hereby certify that this correspondence with all indicated enclosures is being transmitted by telefax to (571) 273-8300 on the date indicated below, and is addressed to: COMMISSIONER FOR PATENTS, P.O. BOX 1450, ALEXANDRIA, VA 22313-1450.

12/5/08

Name: Walter F. Fasse - Date: December 5, 2008